

Adaptive Feedforward Feedback Control Framework, Phase I

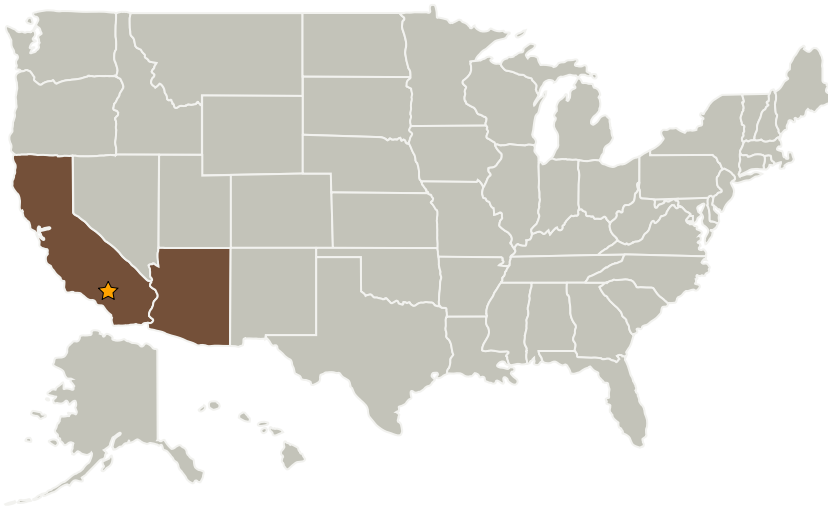
Completed Technology Project (2008 - 2008)



Project Introduction

A novel approach is proposed for the suppression of the aircraft's structural vibration to increase the resilience of the flight control law in the presence of the aeroelastic/aeroservoelastic (AE/ASE) interactions. Currently aircrafts with non-adaptive control laws usually include roll-off or notch filters to avoid AE/ASE interactions. However, if changes in the aircraft configuration are significant, the frequencies of the flexible modes of the aircraft may be shifted and the notch filters could become totally ineffective. With the proposed approach, the flexible modes can be consistently estimated in real-time via system identification algorithm. The identified flexible modes information is sought to be injected to the adaptive control algorithm to update a set of pre-chosen basis functions. These are the key elements for the effectiveness of the proposed method. As a result, undesirable effects of elastic modes will be suppressed while the whole system stability being maintained. Two case/analysis scenarios will be considered. First, the feedforward filter topology will be mainly used to reduce any atmospheric induced structural vibration of the aircraft. Second, the adaptive feedback control is triggered to suppress any AE/ASE interactions, and prevent any possible Flutter/Limit Cycle Oscillation (LCO) of the actual flexible aircraft.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
ZONA Technology, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona

Primary U.S. Work Locations

Arizona	California
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Dario H Baldelli

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity